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UNITED STATES  
STANDARDS  
*for grades of*  
GRAPEFRUIT JUICE



EFFECTIVE DECEMBER 7, 1968

First Issue  
*As Amended*

These standards supersede the standards  
which have been in effect since  
October 1, 1968



This is the first issue of United States Standards for Grades of Grapefruit Juice, as such. These standards supersede the seventh issue of United States Standards for Grades of Canned Grapefruit Juice, as last amended on December 20, 1963; and provide new quality standards for other single strength grapefruit juices such as reconstituted canned grapefruit juice and juices normally marketed under refrigeration.

These standards were published in the Federal Register of February 2, 1968 (33 F.R. 2500) and became effective on October 1, 1968 (33 F.R. 4104). They were amended December 7, 1968 (33 F.R. 18225) to define citric acid content as grams per 100 grams of juice.

This grade standard is issued under authority of the Agricultural Marketing Act of 1946 which provides for the issuance of official U.S. grades to designate different levels of quality for the voluntary use of producers, buyers, and consumers. Official grading service is also provided under this Act upon request of the applicant and upon payment of a fee to cover the cost of the service.

As is the case of other standards for processed fruits and vegetables, these standards are designed to serve as a convenient basis for sales, for establishing quality control programs, and for determining loan values. They will also serve as a basis for the inspection of this commodity by Federal inspection service, which is available for the inspection of other processed products as well.

These standards are issued by the Department after careful consideration of all data and views submitted and the Department welcomes suggestions which might aid in improving these standards in future revisions. Comments may be submitted to, and copies of these standards obtained from:

Chief, Processed Products Standardization and Inspection Branch  
Fruit and Vegetable Division, AMS  
U.S. Department of Agriculture  
Washington, D. C. 20250



# UNITED STATES STANDARDS FOR GRADES OF GRAPEFRUIT JUICE

Effective December 7, 1968

## PRODUCT DESCRIPTION, TYPES, STYLES, AND GRADES

### Secs.

- 52.6121 Product description.
- 52.6122 Types.
- 52.6123 Styles.
- 52.6124 Grades.

### FILL OF CONTAINER

- 52.6125 Recommended fill of container.

### FACTORS OF QUALITY

- 52.6126 Ascertaining the grade of a sample unit.
- 52.6127 Ascertaining the rating for the factors which are scored.
- 52.6128 Color.
- 52.6129 Defects.
- 52.6130 Flavor.

## EXPLANATIONS AND METHODS OF ANALYSIS

- 52.6131 Definitions of terms and methods of analysis.

### LOT COMPLIANCE

- 52.6132 Ascertaining the grade of a lot.

### SCORE SHEET

- 52.6133 Score sheet for grapefruit juice.

**AUTHORITY:** The provisions of this subpart issued under secs. 202-208, 60 Stat. 1087, as amended; 7 U.S.C. 1621-1627.

## PRODUCT DESCRIPTION, TYPES, STYLES, AND GRADES

### § 52.6121 Product description.

(a) Grapefruit juice is the unfermented liquid obtained from mature fresh grapefruit (*Citrus paradisi*). The fruit is

prepared and the juice extracted and processed in a manner to assure a clean and wholesome product. Soluble solids, insoluble solids, Brix-acid ratios, and flavor may be adjusted by suitable manufacturing procedures to any level within the normal range of mature grapefruit.

(b) The product is processed by appropriate physical means to assure its preservation through normal marketing channels. Such means include but are not limited to:

(1) *Canning*. Processing with heat so as to assure the preservation of the juice in hermetically sealed containers.

(2) *Refrigerating*. Reducing the temperature of the product so as to extend its market life. The juice may or may not have been subjected to heat prior to refrigerating. It may or may not be packed in hermetically sealed containers.

### § 52.6122 Types.

Grapefruit juice may be identified as one of the following types.

(a) *Single strength type*. Composed of single strength grapefruit juice, with or without added grapefruit juice concentrate.

(b) *Reconstituted type*. Composed of grapefruit juice concentrate and water, with or without added single strength grapefruit juice.

### § 52.6123 Styles.

(a) Unsweetened.

(b) Sweetened with nutritive sweeteners.

### § 52.6124 Grades.

(a) "U.S. Grade A" (or U.S. Fancy) is the quality of grapefruit juice that:

(1) Shows no coagulation or no material separation and has the appearance of fresh grapefruit juice, (2) has a good

**NOTE:** Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act or with applicable state laws and regulations.

color, (3) is practically free from defects, (4) possesses a good flavor, and (5) scores not less than 90 points when scored in accordance with the scoring system outlined in this subpart.

(b) "U.S. Grade B" (or U.S. Choice) is the quality of grapefruit juice that: (1) Shows no more than a slight coagulation, (2) has a reasonably good color, (3) is reasonably free from defects, (4) possesses a reasonably good flavor, and (5) scores not less than 80 points when scored in accordance with the scoring system outlined in this subpart.

(c) "Substandard" is the quality of grapefruit juice that fails to meet the requirements of U.S. Grade B.

#### FILL OF CONTAINER

##### § 52.6125 Recommended fill of container.

The recommended fill of container is not incorporated in the grades of the finished product since fill of container, as such, is not a factor of quality for the purpose of these grades. If in retail size containers it is recommended that the containers be as full of grapefruit juice as practicable.

#### FACTORS OF QUALITY

##### § 52.6126 Ascertaining the grade of a sample unit.

(a) *General.* Consideration is given to the degree of coagulation and separation and the appearance of the product, the rating for the factors which are scored, and the limiting rules which may apply.

(b) *Factors rated by score points.* The relative importance of each scoring factor is expressed numerically on the scale of 100. The maximum number of points that may be given such factors are:

	<i>Factors</i>	<i>Points</i>
Color	-----	20
Defects	-----	40
Flavor	-----	40
Total score	-----	100

##### § 52.6127 Ascertaining the rating for the factors which are scored.

The essential variations within each factor which is scored are so described

that the value may be ascertained for each factor and expressed numerically. The numerical range within each factor which is scored is inclusive (for example, "18 to 20 points" means 18, 19, or 20 points).

##### § 52.6128 Color.

(a) (A) *Classification.* (1) Grapefruit juice that has a good color may be assigned 18 to 20 points.

(2) "Good color" means a color that is bright and typical of freshly extracted grapefruit juice. It may be either: pale yellow to very slightly amber, typical of the juice of properly ripened white fleshed grapefruit; or slightly red, typical of the juice of red or deep pink fleshed grapefruit.

(b) (B) *Classification.* (1) Grapefruit juice that has a reasonably good color may be assigned 16 or 17 points. Grapefruit juice of this color may not be graded above U.S. Grade B regardless of the total score for the product (limiting rule).

(2) "Reasonably good color" means a color that may be slightly dull or slightly brown, as caused by scorching, oxidation, or caramelization. This color may be characteristic of the juice from red or pink grapefruit of advanced maturity or of mixtures of the juice from white and colored varieties.

(c) (SStd.) *Classification.* Grapefruit juice that fails to meet the Grade B classification for color may be assigned 0 to 15 points and shall not be graded above Substandard regardless of the total score for the product (limiting rule).

##### § 52.6129 Defects.

(a) *General.* The factor of defects concerns the degree of freedom from small seeds and seed portions; from discolored specks, harmless extraneous material, and other similar defects; from juice sacs and particles of membrane, core, and peel in excess of that normally present in grapefruit juice.

(b) (A) *Classification.* (1) Grapefruit juice that is practically free from defects may be assigned a score of 36 to 40 points.

(2) "Practically free from defects" means that the juice may not contain



more than 10 percent free and suspended pulp as determined by the method outlined in this subpart, and that any other defects present may no more than slightly detract from the appearance or drinking quality of the juice.

(c) (B) *Classification*. (1) If the grapefruit juice is reasonably free from defects, a score of 32 to 35 points may be given. Such grapefruit juice may not be graded above U.S. Grade B regardless of the total score for the product (limiting rule).

(2) "Reasonably free from defects" means that the juice may not contain more than 15 percent free and suspended pulp as determined by the method outlined in this subpart, and that any other defects present may not seriously detract from the appearance or drinking quality of the juice.

(d) (SStd.) *Classification*. Grapefruit juice that fails to meet the U.S. Grade B classification for defects may be assigned a score of 0 to 31 points and shall not be graded above Substandard regardless of the total score for the product (limiting rule).

#### § 52.6130 Flavor.

(a) (A) *Classification*. (1) Grapefruit juice that has a good flavor may be given 36 to 40 points.

(2) "Good flavor" means a flavor that is fine, distinct and substantially typical freshly extracted grapefruit juice. Such juice is affected only slightly by the process, the packaging, or storage conditions and complies with the analytical limits provided in Table I.

TABLE I  
ANALYTICAL REQUIREMENTS—U.S. GRADE A

	Single strength type		Reconstituted type	
	Unsweet-ened	Sweet-ened	Unsweet-ened	Sweet-ened
Brix—Minimum.....	9.0°	11.5°	10.0°	11.5°
Ratio: Minimum.....	8:1	9:1	8:1	9:1
Maximum.....	14:1	14:1	14:1	14:1
Oil—Maximum Percent by volume.....	0.020	0.020	0.020	0.020

(b) (B) *Classification*. (1) If the flavor is only reasonably good 32 to 35 points may be given. Grapefruit juice of this flavor may not be graded above U.S. Grade B regardless of the total score for the product (limiting rule).

(2) "Reasonably good flavor" means a flavor less desirable than "good flavor" because of excess bitterness, terpenic, processing, storage, or container flavors but is not seriously objectionable. Such juice complies with the analytical limits provided in Table II.

TABLE II  
ANALYTICAL REQUIREMENTS—U.S. GRADE B

	Single strength type		Reconstituted type	
	Unsweet-ened	Sweet-ened	Unsweet-ened	Sweet-ened
Brix—Minimum.....	9.0°	11.5°	10.0°	11.5°
Ratio—Minimum.....	7:1	9:1	7:1	9:1
Oil—Maximum percent by volume.....	0.025	0.025	0.025	0.025

(c) (SStd.) *Classification*. Grapefruit juice that fails the requirements of the U.S. Grade B classification for flavor may be given a score of 0 to 31 points and shall not be graded above Substandard regardless of the total score for the product (limiting rule).

#### EXPLANATIONS AND METHODS OF ANALYSIS § 52.6131 Definitions of terms and methods of analysis.

(a) *Brix*. "Brix" means the degrees Brix of the juice when tested with a Brix hydrometer calibrated at 20° C. (68° F.) and to which any applicable temperature correction has been made. The degrees Brix may be determined by any other method which gives equivalent results.

(b) *Acid*. "Acid" means the grams of total acidity, calculated as anhydrous citric acid, per 100 grams of juice. Total acidity is determined by titration with standard sodium hydroxide solution, using phenolphthalein as indicator.

(c) *Brix-acid ratio*. "Brix-acid ratio" means the ratio between the Brix and the acid as defined in this section.

(d) *Recoverable oil*. "Recoverable oil" means the percent by volume of oil recovered by the Bromate titration method as described in the June 1966 issue of the Journal of the Association of Analytical Chemists (vol. 49, No. 3, 1966), by W. Clifford Scott and M. K. Veldhuis.

(e) *Free and suspended pulp*. Free and suspended pulp means the percentage of pulp determined by the following method: Graduated centrifuge tubes with a capacity of 50 ml. are filled with juice and placed in a suitable centrifuge. The speed is adjusted, according to diameter, as indicated in Table No. I, and the juice is centrifuged for exactly 10 minutes. As used in this subparagraph, "diameter" means the overall distance between the bottoms of opposing centrifuge tubes in operating position. After centrifuging, the milliliter reading at the top of the layer of pulp in the tube is multiplied by 2 to give the percentage of pulp.

TABLE NO. III

<i>Diameter (inches)</i>	<i>Approximate revolutions per minute</i>
10	1,609
10½	1,570
11	1,534
11½	1,500
12	1,468
12½	1,438
13	1,410
13½	1,384
14	1,359
14½	1,336
15	1,313
15½	1,292
16	1,271
16½	1,252
17	1,234
17½	1,216
18	1,199
18½	1,182
19	1,167
19½	1,152
20	1,137

## LOT COMPLIANCE

## § 52.6132 Ascertaining the grade of a lot.

The grade of a lot of grapefruit juice

covered by these standards is determined by the procedures set forth in the regulations governing inspection and certification of processed fruits and vegetables, processed products thereof, and certain other processed food products (§§ 52.1 to 52.87).

## SCORE SHEET

## § 52.6133 Score sheet for grapefruit juice.

Size and kind of container.....		
Container mark (packages).....		
or		
Identification (cases).....		
Label (including ingredient statement, if any).....		
Liquid measure (fluid ounces).....		
Style.....		
Brix (degrees).....		
Acid (grams/100 grms: calculated as anhydrous citric acid).....		
Brix-acid ratio ( ).....		
Recoverable oil (percent by volume).....		
Degree of coagulation { ( ) None.....		
{ ( ) Slight.....		
{ ( ) Serious.....		
Factors	Score points	
Color.....	20	{ (A) 18-20 (B) 16-17 (SStd) 10-15
Defects.....	40	{ (A) 36-40 (B) 32-35 (SStd) 10-31
Flavor.....	40	{ (A) 36-40 (B) 32-35 (SStd) 10-31
Total score.....	100	
Grade.....		

<sup>1</sup> Indicates limiting rule.

To become effective upon publication in the FEDERAL REGISTER.

Dated: December 5, 1968.

G. R. GRANGE,  
Deputy Administrator,  
Marketing Services.

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Effective date changed to October 1, 1968 (33 F. R. 4104)

Amended December 7, 1968 (33 F.R. 18225)



# BROMATE TITRATION (Scott) METHOD FOR DETERMINING RECOVERABLE OIL

## METHOD

### (1) Reagents.

*Standard bromide-bromate solution*—prepared and standardized to 0.099N in accordance with Chapter 42, Standard Solutions in the current edition of the AOAC.<sup>1</sup> For use, add 1 volume of standard solution to 3 volumes of water to make 0.0247N solution. 1 ml. of 0.0247N solution supplies bromine to react with 0.00085g., or 0.0010 ml., of *d*-limonene. The solutions are stable for 6 months.

*2-Propanol*—Reagent grade ACS (American Chemical Society).

*Dilute hydrochloric acid*—prepared by adding 1 volume of concentrated acid to 2 volumes of water.

*Methyl orange indicator*—0.1 percent in water.

### (2) Apparatus.

*Electric heater*—with recessed refractory top, 500–750 watts.

*Still, all glass*—500 ml. distillation flask with 24/40 standard taper neck; 200 mm. Graham condenser with 28/15 receiving socket and drip tip; connecting bulb and adapter as shown in Figure 1.

<sup>1</sup>“AOAC” refers to the Official Methods of Analysis published by the Association of Official Analytical (formerly Agricultural) Chemists. Copies may be obtained from this Association at Box 540, Benjamin Franklin Station, Washington, D.C. 20044.

*Burette*—10 ml. or 25 ml. graduated to 0.1 ml., with easily controllable flow to permit both rapid and dropwise titration.

### (3) Determination.

(i) Pipette 25 ml. of well-mixed sample (juice or reconstituted juice) into the distillation flask containing carborundum chips or glass beads, and add 25 ml. of 2-Propanol.

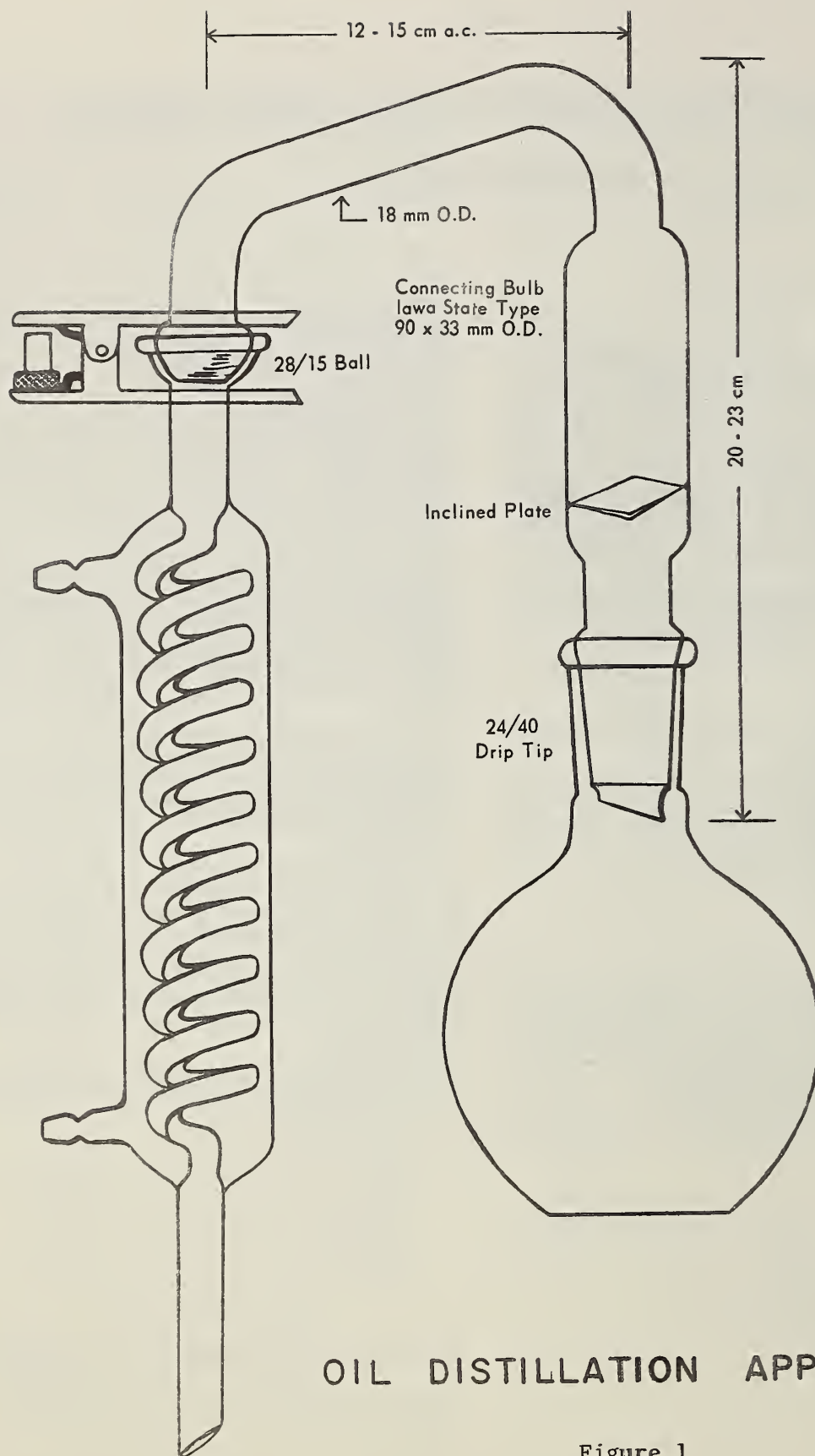
(ii) Distill into a 150 ml. beaker. Continue distilling until solvent ceases to reflux then remove the flask from the heater.

(iii) Add 10 ml. of dilute hydrochloric acid and 1 drop of indicator. (An alternative method would be to prepare a solution containing 5 ml. of indicator and 1,000 ml. of dilute hydrochloric acid—then add 10 ml. of this acid-indicator mix to the 150 ml. beaker.)

(iv) Titrate with the dilute bromate solution while stirring. The major portion of the titrant may be added rapidly, but the endpoint must be approached at about 1 drop per second. Disappearance of color indicates the endpoint.

(v) Determine the reagent blank by titrating three separate mixtures of 25 ml. 2-Propanol and 10 ml. of dilute hydrochloric acid with indicator—without refilling the burette. Divide the total milliliter of titrant used by three to obtain the average blank. Subtract the average blank thus obtained from the milliliter of titrant used to titrate the distillate.

(vi) Multiply the remainder by 0.004 to obtain the percent recoverable oil by volume in the juice sample.



OIL DISTILLATION APPARATUS

Figure 1



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